Promoting exercise on prescription: recruitment, motivation, barriers and adherence in a Danish community intervention study to reduce type 2 diabetes, dyslipidemia and hypertension

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ORIGINAL ARTICLE

Promoting exercise on prescription: recruitment, motivation, barriers and adherence in a Danish community intervention study to reduce type 2 diabetes, dyslipidemia and hypertension

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Abstract
Objective The aim of this study is to analyse recruitment, motivation, barriers and adherence to increasing physical activity in a community-based 1-year intervention.
Research design and methods This study included a baseline investigation of 1,156 participants (67% female, 33% male), a post-intervention investigation after 4 months and a follow-up assessment after 1 year. All patients included in the study were physically inactive, had a body mass index (BMI) of less than 35 and were mobile enough to participate in physical training. The inclusion criteria are at least one of the following diagnoses: type 2 diabetes, above-normal cholesterol level (dyslipidemia) or above-normal blood pressure (hypertension). Theory-based activities to promote physical activity and nutrition counselling were implemented, and self-report questionnaires investigated attitude, experiences and barriers towards physical activity and self-reported health.
Results The findings indicated an increase in physical activity and fitness level, weight loss and lower body mass index both immediately after the training period and after 1 year. The programme led to reduced tobacco use. The recruitment of the patients is not representative of the general population. More better educated and female patients participated in the programme. Weight loss was the main motivation for participation, while weight gain was the main reason for dropping out of the programme. Patients who lived with a partner accomplished 10% more than did patients who lived alone, and patients who reported a good or very good state of health at baseline were more successful in completing the programme than were patients who reported having a "bad" state of health. The reported psychological barriers include physical barriers, emotional barriers, motivational barriers and time-related barriers. Motivation was strengthened by the training group, and especially the overweight patients experienced coherence and meaning in the group training activities.
Conclusions A theory-driven community intervention can lead to an increase in physical activity. Training with a group is beneficial for motivation and adherence.

Keywords Physical activity · Nutrition counselling · Patient adherence · Motivation · Barriers

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Introduction

During the last few decades, private and public sectors have focussed a great deal of attention on physical exercise (Blair et al. 1989). Physical inactivity contributes to weight gain and the development of type 2 diabetes as well as musculo-skeletal problems such as osteoporosis (Pedersen and Saltin 2006; Leon and Sanchez 2001). There is evidence that physical activity can lower blood pressure and reduce the risk of coronary heart disease and stroke (Whelton et al. 2002; Cornellisen and Fagard 2005), help to achieve weight loss and manage diabetes (Tuomilehto et al. 2001; Houmard et al. 2004) even for children (Stewart et al. 2005), reduce the risk of developing breast and colon cancer (Thune and Furberg 2001) and degenerative bone disease, and relieve moderate depression (Di Lorenzo et al. 1999; Babyak et al. 2000; Blumenthal et al. 1999).

Physical health is also associated with a person's psychological well-being (Fox 1997), and people who are physically active report greater self-esteem, enhanced mood and confidence in their physical functioning, with possible beneficial effects for relieving symptoms of depression and anxiety (e.g., Bouchard et al. 1994). However, a large number of Europeans lead a sedentary lifestyle, and successful interventions to encourage participation in physical activity are essential (Biddle and Mutrie 2001; Stewart et al. 2005). Furthermore, it is important to acknowledge that behavioural change is anchored in a psychological and social context (Faulkner and Taylor 2005; Biddle and Mutrie 2001; Landers 2001; Mutrie 1997; Dishman 1994). The importance of the interaction among physiological, psychological and social factors is emphasised by health psychology research, which focusses on individual health and people's ability to change their behaviour (Ogden 2004; Sarafino 1998; Antonovsky 1979; De Vries 1998; Prochaska and Diclemente 1983; White 2005).

For research relating to physical activity and exercise, it is important to investigate the role of physical activity and movement in this inter-disciplinary context. This article describes an intervention aimed at increasing physical activity in patients suffering from type 2 diabetes, hypertension and/or dyslipidemia.

Interventions to increase physical activity can occur in an educational, behavioural or environmental surrounding. The present study on physical activity and nutrition is funded by the Public Health and Care Administration of the City of Copenhagen, the capital of Denmark. The prevalence of overweight inhabitants in Copenhagen has increased during the last decade; currently, every third individual is overweight, and the level of physical activity is decreasing (The Danish Health and Morbidity Survey 2000).

Exercise and diet on prescription

Since April 2004, more than 1,900 patients in Copenhagen have been given an "Exercise and Diet Prescription (EDP)" by their general practitioners. The aim of the intervention programme is to help patients change their lifestyles by giving them physical training and dietary guidance. To be included in the programme, the patients must be physically inactive, have a body mass index[1] (BMI) of less than 35, be mobile enough to participate in supervised physical training and have at least one of the following diagnoses: type 2 diabetes, above-normal cholesterol level (dyslipidemia) or above-normal blood pressure (hypertension). In addition, one or more of the following criteria must be met: fasting glucose >6.0 mmol/l (measured in venous blood sample), triglyceride >1.8 mmol/l, total cholesterol >5.2 mmol/l or systolic blood pressure >140 - <180 and diastolic blood pressure >90 - <110 mmHg.

[1] Body mass iindex (BMI) is a measure of body fat based on height and weight that applies to both adult men and women.

Materials and methods

The intervention period in this study was 1 year. During this time, the patients received 4 months of supervised physical training in groups. In addition, they participated in a physical training programme to enable them to be physically active at least 3 h per week. The physiotherapist and dieticians conducted special training programmes on exercise and diet. Patients also received detailed dietary guidance by a dietician up to eight times a year (Millner and Rollnick 2002) and motivational dialogue based on the Stages of Change principles (Prochaska and diClemente 1983).

The participants were administered a fitness test, and various blood values, blood pressure, waist circumference, weight and BMI were measured at baseline, at the end of the supervised training programme (4 months), 6 months after baseline and 12 months after baseline.

The research evaluation was carried out from 2004–2007 in cooperation with the Research Centre for Sports, Health and Civil Society, University of Southern Denmark, Prof. Bengt Saltin and the City of Copenhagen, Health and Care Administration (Roessler et al. 2007). The analyses include clinical data, questionnaires, qualitative interviews and focus group interviews with the dieticians and the physiotherapists.

The study includes a number of outcomes. There are data from the general practitioner who referred the patient to the Exercise and Diet on prescription programme. The general practitioner measured the blood parameters four times a year. The patients' fitness ratings were recorded by the physiotherapist's clinic. Fitness was tested using a sub-maximal one-point bicycle test four times a year. Weight, BMI and waist circumference were measured four times a year. A quantitative questionnaire survey was administered (n= 1,156), which the patients received at baseline, approximately 4 months and 1 year after having started the programme. The questionnaire investigates the attitude, experiences and barriers towards physical activity and self-reported health.

Statistics

Differences in proportions were analysed with chi-square tests. Differences between groups were analysed using independent t-tests. Predictors of weight changes were examined using linear regressions.

Results

Recruitment

Sixty-seven percent of the patients included in the study are female, and about 44% were older than 60 at initial assessment. At the start of the study, 37% of the participants had a body mass index (BMI) between 25 and 30, 37% had a BMI between 30 and 35, and 28% had a BMI higher than 35 (Table 1).

Compared to the population of the City of Copenhagen (2005), the patients in the programme are less physically active (Table 2) and have a worse self-estimated health status (Table 3).

Only about 25% of the patients in the study were physically active for the 30 min a day recommended by the World Health Organisation (WHO) compared to more than 40% of the residents of Copenhagen in general.

Only about 30% of the patients in the study rated their state of health very good or good compared to over 70% of the citizens of Copenhagen in general.

Accomplishment and adherence

One criterion for measuring the success of the programme was participation and accomplishment of 75% of the patients during the 4 months of intervention. This criterion was almost reached; 70% of the patients (N=811) completed the 4-month intervention, 18% quit the study before the last interview with the dietician and 12% missed both training and nutrition counselling. "Younger" patients (age less than 50) did worse in terms of showing up for the nutrition counselling than did "elder" patients (over 50 years old). Only 33% of participants under 50 showed up for the first nutrition counselling session compared to 60% of the participants over 50. Patients who were not smoking at baseline were 10% more likely to finish the intervention programme than were patients who reported smoking every day at baseline. In general, the percentage of smokers decreased during the intervention period; 17% of the every day smokers stopped smoking during the training period and were still non-smokers after 1 year. Of the occasional smokers, 72% stopped smoking after 1 year. Patients who live with a partner completed 10% more than did patients who live alone. Patients who reported a good or very good state of health at baseline were better at completing the programme (Table 4). More than 80% of the patients who described their state of health as "good" or "very good" completed the programme, whereas 66% of the patients who reported a "bad" state of health and 54% of the patients who reported a very bad state of health dropped out of the programme.

Patients who do not lose weight during the 4 months of the training programme were less likely to attend the follow-up nutrition counselling after 1 year (Table 5).

The educational background of the patients (67% with primary school education, 33% with secondary school education) was not associated with adherence to the programme.

Table 1 Gender, age, weight, body mass index (BMI) of the participants (n=1,156) at baseline (in %)

Sample at baseline	N=1,156
Gender	
Female	67%
Male	33%
Age	
<40	8.6%
40–49	15.2%
50–59	32.6%
60–69	33.2%
>70	10.4%
Weight (kg at baseline)	
Female	88 kg
Male	101 kg
BMI (body mass index)	
<25	5%
25–29	30%
30–35	37%
>35	28%

Table 2 Level of physical activity: a comparison of the residents of Copenhagen in 2005 and the patients in Exercise and Diet Prescription (EDP) at baseline (in %). (Question: how often are you physically active during a day for at least 30 min?)

		Every day	2–3 times	Max. once	Never	N
Male	Copenhagen	42	37	15	6	1,140
	EDP	25	38	30	7	282
Female	Copenhagen	43	35	15	6	1,675
	EDP	27	34	31	8	622

Clinical results

The study is not a randomised trial, and the clinical improvements cannot be confirmed. However, some changes in the patient's health are likely related to participation in a physical exercise programme (Pedersen and Saltin 2006). Weight loss and decreased waist circumference, fitness rate and the body mass index of the patients who completed tests at baseline, after the intervention and after 1 year are presented in Table 6. See also Table 7.

The BMI is not a constant variable during life; it changes with age and is dependent on gender. A BMI between 20

Table 3 Self-reported health status of Copenhagen residents in 2005 and patients in Exercise and Diet Prescription (EDP) (in %)

		Very good	Good	Tolerable	Bad	Very bad	N
Male	Copenhagen	23	49	20	5	2	1,133
	EDP	3	28	54	15	1	279
Female	Copenhagen	21	50	23	5	1	1,666
	EDP	1	27	56	15	1	610

and 25 is normal, between 26 and 30 is considered overweight, and over 35 is considered obese (Kuczmarski et al. 2002). The BMI and the specific cutoff points for children are different from adults (Cole et al. 2000).

However, in this study, there were no significant differences in gender and age groups concerning BMI, weight and waist circumference. The only significant exceptions were the BMI values of the youngest female patients (under 40 years old), with an average BMI of 33.7 (compared to 31.8 for the entire population).

The patients who completed training and counselling after 1 year had lost 3.3 kg on average. If the analysis is restricted to patients who at the first measurement had a value on the parameter concerned, which was poorer than normal, the findings show considerably greater improvement.

The 340 participants improved their fitness levels during training by 18% ($p<0.01$). At the start, the average fitness level was 23.6 ml/min/kg (SD=8.0 ml/min/kg). There was no difference in the amount males and females improved, nor was age significant concerning the degree of improvement. The improvement, therefore, is analysed without adjustment, and a paired t-test shows a significant improvement of 3.2. ml/min/kg.

Physical activity, motivation and barriers

The patients' self-reported experience indicates that more than half of the participants experienced an improvement in "self-reported health status" and in general were more physically active. One year after baseline, 29% of the patients reported they were physically active 30 min every day (26% at baseline), 52% several times a week (36% at baseline) and 16% (30% at baseline) were active once a week. Only 3% of the participants (7.5% at baseline) reported they did not exercise at all. The majority of the patients reported they enjoyed physical activity, compared to how they felt at the start of the programme. After 1 year of physical training, 75% of the participants reported they exercise alone, while 25% exercise with a friend or in a group.

A total of 35% of the participants reported they exercise at a fitness centre, 23% in a sports association, 9% in evening classes and 16% elsewhere. The most frequently reported modes of exercise and physical activity are brisk walks, gardening and bicycling. Seventeen percent of the participants did not report where they exercise.

The barriers reported by patients can be divided into the following four categories: physical barriers (e.g., I can't exercise because of an injury), emotional barriers (e.g., I'm too lazy), motivational barriers (e.g., I haven't got energy, I'm too tired after my job) and time-related barriers (e.g., I haven't got the time).

The patients reported a higher motivation when they feel engaged in a group and train under supervision or in a structured environment. Being physically active with other patients suffering from similar health problems, for 22% of the patients, had the effect of overcoming barriers. The patients reported that the rigid structure of fixed training times helped them to participate in the programme. One of the most obvious effects of physical activity and an often reported aspect is the subjective feeling of having more

Table 4 Patients in exercise and diet on prescription who completed the intervention programme, categorised by their self-rated state of health at baseline (in %)

Self-rated state of health	Completed the programme	Dropped out of the programme	N
Very good	80	20	15
Good	83	17	239
Tolerable	77	23	489
Bad	66	34	133
Very bad	54	46	13
All	77	23	889
P<0.01			

Table 5 Patients in exercise and diet on prescription who attended follow-up counselling after 12 months, categorised by their weight loss during the intervention period of 4 months (in %)

Weight difference baseline - 4 months	Participated the follow-up counselling	Did not participate in the follow-up counselling	N
>5 kg weight loss	45	55	244
2.5–5 kg weight loss	51	49	277
0–2.5 kg weight loss	44	57	336
Gain weight	34	66	186
All	44	56	1,043
P<0.01			

Table 6 BMI, weight, waist circumference and fitness at (1) baseline, (2) after 4 months training and (3) 1 year after start for all patients who completed the 12-month programme (average ± SD)

	1st test (baseline)	2nd test (after 4 months)	3rd test (after 12 months)
Body mass index			
N=445	31.8±5.3	30.7±5.1	30.5±5.1
Weight, kilogram (kg)			
N=445	90.7±18.1	87.3±17.2	87.4±17.4
Waist, centimetre (cm)			
N=423	105.2±14.0	100.3±12.9	100.4±13.4
Fitness, ml kg-1 min-1*			
N=340	23.6±8.0	28.2±9.2	26.8±9.3

*ml kg-1 min-1: oxygen consumption per kilo and minute

energy and self-control (e.g., "It is good to use my muscles and get my heart-rate up." "I feel better in controlling my daily life").

Discussion

The fitness improvements achieved during the 4-month training period were maintained up to 12 months after the patients started in their physical training and dietary guidance programmes. The majority of patients achieved an improvement in relevant health parameters and reported that they had improved their health and life quality. Approximately 70% of the 1,156 patients maintained their physical training programme and complied with the dietary guidance during the study period. The study attempted to describe the recruitment to the intervention programme, discuss the psychological expectations and barriers, and analyse adherence after the 4-month training programme.

The Exercise and Diet Prescription programme is an intervention, not a randomised trial. However, the study allows us to examine some factors that encourage patients to be physically active and to explore the main barriers and factors regarding adherence. The recruitment of the participants in the study was not balanced; there were more females who participated in the study than males. This can be explained with gender role attitudes and the higher interest of women in health-related issues (Verbrugge 1985). The psychological motivation to complete the programme indicates that weight loss and better state of health were the main motives for participating in the programme. These expectations were fulfilled for half of the patients. Patients older than 50 were better at accomplishing the training intervention than were patients younger than 50. Patients who were gaining weight instead of losing were more likely to drop out of the programme. This might be a "marketing" problem of "Exercise on Prescription" programmes in general. Exercise on Prescription is not a weight loss programme, even if the patients on average lost some weight. But knowing that "looking good" and "improving health" are often quoted reasons for participating in physical exercise programmes (e.g., King 1991; Sallis and Owen 1999) and knowing that self-motivation is an important factor for adherence (Dishman 1994), the aspect of weight loss should be considered in further studies.

Table 7 Motives for participation and fulfilled expectations after 1 year (in %)

Motives for participation % (N=587)	Expectations at baseline	Fulfilled expectations after 1 year
Improve health	52	58
Weight loss	60	52
Physical well-being	27	65
Be more physically active	41	58
Social interaction	11	40

Improvements in fitness level are more crucial for reducing the risk of terminal strokes and acute heart failure than is weight loss (Lewington et al. 2002). The improvements in fitness achieved during the course of the first 4 months and maintained up to the 12-month follow-up after patients started their physical training and dietary guidance are therefore much more important from a health perspective. Community programmes can be an important approach to reducing risk factors (see Jenum et al. 2006) and promoting behavioural change.

The psychological barriers reported by participants are divided into physical, emotional, motivational and time-related barriers. These barriers are quite similar to those reported in the Allied Dunbar National Fitness Survey (Biddle and Mutrie 2001). Participating in physical activity in a social context was not mentioned as an expectation for the patients at baseline. However, they reported after 1 year that the role of the group environment at the clinic was important and beneficial for their well-being. A summary of randomised trials investigating the effects of exercise on smoking cessation by Taylor and Ussher (2005) indicated the positive influence of exercise on quitting smoking.

These findings are supported by the results of the Exercise on Prescription study.

Overall, the results suggest that a 1-year physical activity and dietary counselling intervention produced both positive psychological as well as clinical results. The intervention improved physical fitness, and the participants expressed motivation to remain physically active after the programme had ended. The reported self-perception of being healthier after the Exercise on Prescription period ended is likely a good predicator for future health status.

Conclusions and perspectives

Participation in an exercise and nutrition counselling on prescription programme has more advantages than disadvantages. The exercise is associated with positive changes in fitness, weight, self-esteem and self-perception. It is possible to increase physical activity in the short term, and motivation can be improved by structured training in a group. Future health-related research should involve interdisciplinary efforts.

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Conflict of interest The authors disclose any relevant associations that might pose a conflict of interest.

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